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Queensland. Albert River, July, 1866, to September, 1866. 'South Australia': a collection of papers, containing a Report of J. McKinlay's Northern-Territory Explorations; also a portion of his Journal, and proceedings of the surveying schooner *Beatrice*. 'Report of the Central Argentine Railway, 1867.' From the Secretary. Engravings of Christopher Columbus, one by Fry and one by Schriener. A valuable collection of photograph Portraits of the Fellows of the Royal Geographical Society, by Maul and Company.

ACCESSIONS TO THE MAP-ROOM SINCE THE LAST MEETING.—Stieler's Hand-Atlas, in 14 parts, by H. Berghaus and A. Petermann. Missionary Atlas, by Dr. R. Grundemann. Stieler's Karte v. Deutschland, 3 sheets. Map of Hungary—Magyar Korona, by Berghaus-Gönczy. Map of the Holy Land, by Van de Velde. New Map of the Kingdom of Italy, by L. Schiaparelli and C. E. Mayr. Spruner-Menke, Atlas Antiquus, on 31 sheets. Chart of the World, by H. Berghaus and Stülpnagel. All the foregoing presented by Justus Perthes of Gotha. Map of the States and Territories from the Mississippi River to the Pacific Ocean, by G. and C. Colton. Map of California and Nevada, by L. Ransom, &c. Plan of Sweer's Island and Township, Gulf of Carpentaria, Australia. Landsborough's Route, from Bowen Downs to Neelia Creek, Queensland, Australia. Presented by Sir George Bowen.

The following Papers were read :—

1. *On Dr. Livingstone's Last Journey and the probable ultimate Sources of the Nile.* By ALEX. GEO. FINDLAY, F.R.G.S.

THE author stated that the object of his Paper was to demonstrate, as far as it was possible to do so inferentially, that Dr. Livingstone had reached, or was about to enter, the southern limits of the basin of the Nile, when the last painful news of him was forwarded from Africa. This conclusion was the result of a long-standing conviction that Lake Tanganyika would some day prove to be the southern reservoir of the Nile. The author had arrived at this when he was very much engaged with Captains Burton and Speke, in 1859, in discussing and calculating the very copious and most excellent data brought home by their nobly completed expedition of 1856-9.

The points which he wished to insist on were these :—

1. That Dr. Livingstone has determined that the Tanganyika Lake has no connexion with the Nyassa Lake :
2. That all known testimony makes the river at the South end of the Tanganyika Lake run *into* it :

3. That this Lake *must* have an outlet, and that this is probably to the North :

4. That the observations of Sir Samuel Baker, as compared with those of Captain Speke, make the Albert Nyanza on the same level with the Tanganyika Lake, and, further, that the two lakes probably join each other :

5. That therefore the streams which flow north-westward from the mountains at the head of the Nyassa Lake contain the true sources of the Nile.

Lake Nyassa was first seen by Dr. Livingstone Sept. 16, 1859. He had followed up the important River Shiré to its outlet from the lake. It was afterwards visited by the unfortunate Dr. Roscher, who reached it from Kilwa on November 19, two months after Dr. Livingstone had visited it. The lake is very deep, possibly much exceeding 116 fathoms, and has the deep blue or indigo tint of the Indian Ocean—a sufficient proof of its great depth. The eastern shore has not been examined ; but it is known to be limited on that side by lofty mountains. On the west the beautiful tree-covered heights, probably 4000 to 5000 feet high, are the edges of table-lands, through which flow five rivers, the only affluents on this side. These, with what others enter it from the east and north, will be sufficient to account for the annual rise of the lake (about 3 feet) in January, and for the flow of the Shiré.

The northern end of the lake is of the greatest interest in relation to the question now under consideration. It was visited, as is well known, by Dr. Livingstone's expedition, a second time, in October, 1861. The published narrative, and still more the conversations of Dr. Livingstone and Dr. Kirk, lead to the conclusion that no river of considerable magnitude enters the north end of the Nyassa Lake. From the height of at least 1000 feet, over which the land party toiled, the dark mountain masses on both sides of the lake were seen closing in. At this elevation the view extended at least as far as that from the boats ; and it was believed the end of the lake lies on the southern borders of 10°, or the northern limits of 11° s. lat.

The settlement of this point in the physical geography of East Africa carries with it the conclusion as to the water-parting of the whole of the river-systems between the Zambesi and the Nile. For, should any river fall into the north end of Lake Nyassa, it must be a very large one, draining, as it must do, an area of at least 300,000 square British miles, or a country as large as England and France combined.

Dr. Livingstone's first journeys to the Nyassa Lake, therefore,

did all but conclusively determine that Lake Tanganyika has no outlet to the southward.

It has been frequently argued, and especially by Captain Speke, that the Tanganyika Lake drained into the Nyassa. Their relative levels, as far as is known, would admit of such a theory. Dr. Kirk's careful and satisfactory observations, in August to October, 1860, makes Lake Nyassa to be 1522 feet above the sea, a much lower elevation than that previously assigned to it, and *at least* 300 feet, and possibly 1300 feet, below Tanganyika Lake.

Now, as Dr. Livingstone's last journey had for one of its primary objects the determination of this important point, it may be inferred, to a certainty, that his last journey confirmed his previous convictions. We know that he had crossed a marsh, which was found to stretch farther north than he had previously seen, and then continued his journey *westward*. If this marsh had been traversed by the course of a large river, such as the requirements of the case lead to the certain inference, he would have followed up this important feeder to the *northward*, and traced its connexion, if any, with the northern lake, or till its character was really determined.

The author, therefore, held it to be a point now settled beyond controversy, that Dr. Livingstone has determined that Lake Nyassa and Lake Tanganyika have no connexion with each other; and by that decision he has also determined, in a great measure, where we are to look for the true sources of the still mysterious Nile.

The second point was the direction of the streams running south of the Tanganyika Lake.

The distance from the north end of Lake Nyassa to the reported southern part of Lake Tanganyika is about 340 or 350 miles, and the direction is N. 55° W. Of the country immediately intervening we know nothing but from very imperfect native report. About the mountainous country further west we have more information, several important routes having traversed it.

First from Dr. Livingstone. After having explored the western shore of Lake Nyassa, he started from about its centre in September, 1863, for the west, a period of the year too late to accomplish any great exploration. But he succeeded in determining one very important point—the position of the water-parting of the rivers flowing into Nyassa and those flowing westward.

Beyond the point attained by Dr. Livingstone no recent traveller has penetrated, but further to the westward several expeditions have passed from the Portuguese settlements on the Zambesi to within a very few miles of the probable southern end of the Tanganyika Lake. The chief of these are cited, not as novelties, for

they have been often quoted, but because the present moment invests them with a stronger interest.

A Portuguese colonist from Goa, Gonçalo Caetano Pereira, had sent from Tete more than one trading mission to the Cazembe prior to 1786, and in that year sent his son Manoel Pereira in charge of a mission to the same potentate. The accounts given by these enterprising men, as related by Dr. de Lacerda in his preliminary notes to the account of his expedition, contain many geographical features of importance to our present subject.

Manoel Caetano Pereira, the son, started in May, 1786, with his own slaves, and the Muizas who had brought down the Cazembe's ivory the year before, and after traversing the land of the Maravi—a term by which the great lake (Nyassa) was then known to geographers—was forty-five days in reaching the Aroangua River, the stream whose head-waters were found by Dr. Livingstone in September, 1863, and then called the Loangwa or Zumbo—the latter name from the place where it falls into the Zambesi, 220 miles above Tete. In twenty days more he struck another river, called Zambeze, of which Dr. Lacerda says, "From the information of the people I venture to say that it is not our Zambeze or any of its influents from the Xire (Shiré) river upwards. The Zambeze of the Muizas flows to the *right* hand of those crossing it from Tete, and falls into other streams;" but he makes some confusion afterwards in the lakes into which it runs. "Manoel's party travelled thirty days from the river to the King's capital, crossed some deserts, and spent a day fording a lake waist-deep. This body of water is drained by *two* channels, one to the Zambeze, the other to the Murusura River, which passes the royal residence." What follows is almost unintelligible, at least with our present knowledge, but it is directly confirmatory of what Dr. Livingstone has heard so recently.

In the further expedition to the father of the Cazembe chief, Muata-Ya-Nvo, to the north-west, the route appears to cross some of the affluents of the Luapula River, which it could be demonstrated, as far as our imperfect knowledge goes, flows to the north-east and east.

The important mission of Dr. de Lacerda left Tete for the country of the Cazembe on July 3, 1798. The objects of this costly and noble undertaking were, as he tells us, to ascertain if Central Africa contains any mountain capable of sending forth the Cuñene River, which falls into the Atlantic a little below Cabo Negro, and to find a short and easy communication overland from Portugal to the Rios de Sena, and especially to seek the means of bringing these infidels

into the bosom of the Church. In the instructions which he issued to his officers, to be followed in case of his own death, he makes especial mention of the "Zambese," reported by the Pereiras, and directs that if it should flow to the right (that is, *eastward*) they would do well to descend it to ascertain whether it falls into the Shiré, but if to the left or westward, it may be the Cuñene, a river which Dr. de Lacerda had endeavoured, unsuccessfully, to explore in 1798; and then it is to be followed down to its mouth, and thence find their way to Benguella. The same method of proceeding is laid down with respect to the river flowing past the Cazembe's capital.

The expedition started, as before stated, on July 3, 1798, and reached the northern Aroangua River at the end of August; on the 30th they reached the Serra Muchingua, which he named Antonina, in honour of the Prince, fixing astronomically a point about 70 miles south-eastward of it, Mazavamba, in latitude $12^{\circ} 33'$, longitude $32^{\circ} 18' 15''$. This very important position gives us a perfect clue to the course taken by the expedition, and the approximate position of the important Muchingua or Maxinga Range, probably a continuation of that seen by Dr. Livingstone north-west from Lake Nyassa, and which also may be the dividing range of the waters which flow toward the Zambesi on the south and those which pass through the Cazembe's country to the northward. Dr. de Lacerda afterwards speaks of the desolate and rugged country they traversed, and the cold they suffered from, which indicates a lofty region.

On September 10 they reached the northern Zambeze River, and here they made some geographical difficulty. Dr. de Lacerda says:—

"My principal desire being to obtain exact geographical notes of the size and the direction of all streams crossed between Tete and the Cazembe's country, and from the latter to Angola, I laboured to extract information from different Muize Caffres, and from Manoel Caetano Pereira, making repeated and compared inquiries to avoid errors arising from strange languages. All uniformly and repeatedly assured me that the Zambeze (Chambeze) and the Ruçurue River ran to the right of one travelling to the Cazembe. Pereira confirmed this information, from which I infer that he does not know his right from his left hand."

Again :

"To-day (Sept. 11, 1798) I sent to inquire about the course of the Zambeze of sundry Mussucumos, a tribe mixed with the Muizas, some vassals of Cazembe (these were my informants) and others independent: *all* said that it trends to the river which runs by the city of the Cazembe,—whatever be the worth of their information, which at present I neither allow nor disallow."

Now nothing can be more circumstantial or direct than this information, that the rivers (which Gamitto says first flow to the

west) ultimately join that running northward past the Cazembe's city—the Luapula or Guapula River.

When this is connected with what is related by Dr. Livingstone, of the streams flowing westward from what is probably the westernmost spur of the great Maxinga Mountains, and which is further confirmed by the undeviating testimony obtained further north, it seems that it would be a perfectly fair inference to state that Dr. Livingstone had seen and crossed the head-waters of one or other of the streams which flow toward the Cazembe country.

The position of the crossing of this northern Zambeze by Dr. de Lacerda is well ascertained, for on September 21st, 1798, eleven days afterwards, he observed an immersion of Jupiter's first satellite, which gave him the longitude of $30^{\circ} 1' 45''$ E.: this was in latitude $10^{\circ} 20' 35''$, and was his last astronomical observation. The place he calls Mouro Achinto, which Gamitto says was the name of the village chief. When Monteiro was here, October 15, 1831, it was called by the name Messire Chirumba.*

Dr. de Lacerda's further journey to the Cazembe's capital is a narrative of his personal sufferings. He passed near to a great lake on his left hand (westward), which has been called Chama; but this was the name of the district (it is also called the Shuia Lake), and reached Lucenda, October 3, 1798, worn out with fever and anxiety.

The next travellers in this region who give any clear account of the country are Major José Manoel Correa Monteiro, as related by his companion Major A. C. P. Gamitto, who went on a mission to the capital of the Cazembe—Lunda or Lucenda—in 1831-2.† They started June 1, 1831, and followed the same general line of march described by Dr. de Lacerda.‡ On September 19th they crossed the Serra Muxinga,§ called by Dr. de Lacerda "Muchingua," and named by him the "Cordelheira Antonina." No estimate is given of its height; but it must be exceedingly lofty, for on the second day of their ascent they marched a league, continually ascending to the ridge of the mountain, where the pass was obstructed by an immense rock, like a portal to the defile. The direct route lay through a natural aperture, $2\frac{1}{2}$ feet in diameter, in this rock, or else around it, over a terrible and dangerous precipice. This passed, they came upon a difficult and elevated desert country, where they suffered much from hunger.

On their return they reached the Serra Muxingua on August 10,

* 'O Muata Cazembe,' p. 196.

† 'O Muata Cazembe, e os povos, &c., da Africa Austral.; Diario da Expedição Portuguesa commandada pelo Major Monteiro, e redigido pelo Major A. C. P. Gamitto. Lisbon, 1854.'

‡ 'O Muata Cazembe,' p. xviii.

§ Ibid., pp. 170-172.

1832, and give a longer account of it. It stands as it were alone, rising at once abruptly and very steeply from the table-land, but traverses an immense extent of country. It was estimated to reach an elevation above the sea of a league (Portuguese), or about 19,700 feet. Its head was nearly always enveloped in clouds, but no sign of snow or ice was visible or reported. The height, probably, is exaggerated, but Gamitto says that it is by much the most lofty summit in this part of Africa, and has precipices of a prodigious height. It commands most extensive prospects to the northward.*

On October 9th they reached the River Chambezi, called by the natives Cono, a very rapid stream running to the west, but where afterwards no one knew; but Monteiro thought it might reach the Zambeze.† There is nothing, then, in their diary that militates against the results of the much more useful enquiries made by Dr. de Lacerda.

Without following our travellers further, or further alluding to the great lakes they passed, or that of Mofo near to the Cazembe capital, it may be accepted as a general conclusion, from their evidence, that the streams from the north-west of the Lake Nyassa, and northward of the mountainous desert which skirts the Serra Muxinga, run towards the lakes at the Lunda capital, and then, as far as report says, to the north-eastward.‡

To these testimonies we must add the more important one of Dr. Livingstone. As before quoted, he had taken great pains to ascertain from the travelled Babisa and Arabs as much as possible about the country in front.

"There could be no doubt that our informants had been in the country beyond the Cazembe's. The Lualaba is said to flow into the Luapula; and when, for the sake of testing the accuracy of the traveller, it was asserted that all the water of the region round the town of the Cazembe flowed into the Luambadzi, or Luambezi (Zambesi), they remarked, with a smile, 'He says the Loapula flows into the Zambesi—did you ever hear such nonsense?' or words to that effect. Their geographical opinions are now only stated without any further comment than that the itinerary given by the Arabs and others shows that the Luapula is twice crossed on the way to the Cazembe's; and we may add that we have never found any difficulty from the alleged incapacity of the negro to tell which way a river flows."§

Although it is a great trading highway with the Arabs and natives, no European traveller has passed north-eastward of the Cazembe's city.

To carry the argument that the waters flow north-eastward far-

* 'O Muata Cazembe,' p. 402.

† Ibid., p. 447.

‡ See 'Proceedings Royal Geographical Society, 1864,' vol. vi. p. 262. Dr. Kirk confirms this—that the Loapula flows north into a small lake.

§ 'The Zambesi and its Tributaries,' pp. 532, 533.

ther, we derive some information from another region, that of Lake Tanganyika.

All recorded testimony acquired from the natives prior to the first East Africa expedition, and information given to Captain Burton, and every pains taken both by that traveller and Captain Speke, while in the country, only lead to one conclusion—that at the south end of Tanganyika Lake a river, the Runangwa or Marungu, runs *into* it; and it is only of late that any theory has made it run out, and so join the Nyassa Lake. There is nothing more certain known now of any particular of the great Tanganyika Lake than was acquired in the first and only visit made to it, in February to May, 1858; and as the geographical relation of this great and important body of water to African hydrology rests upon a single and very questionable observation, a few brief though well-known particulars are here cited.

The first East Africa expedition, sent out by the Royal Geographical Society in October, 1856, was organised and arranged by Captain Burton. He was joined by Captain Speke at Cairo, Nov., 1856, and finally left Zanzibar for the interior, June, 1857. This fine undertaking was most inadequately subsidized. Only 1000*l.* was supplied by the Government, through the Society; 750*l.* at the outset, and 250*l.* on their return. The rest of the total cost, 2500*l.*, was defrayed jointly by the travellers themselves.

It succeeded beyond expectation; and Mr. Findlay thought he was warranted in stating that there never was an expedition based on such limited means, traversing an entirely unknown country, through miseries and difficulties only then first ascertained, which brought to the knowledge of civilised man such a harvest of information on almost every branch of interest. The topography of Captain Speke is wonderfully perfect, considering his health and means of observation; and the 29th volume of the Society's Journal contains a masterpiece of descriptive geography.

They reached Ujiji, on the shore of the Tanganyika Lake, then seen for the first time, on February 18th, 1858. A single observation of Captain Speke, with what he described to Mr. Findlay as a "bath" thermometer, gave as the elevation of the lake 1844 feet. But this thermometer read 214° instead of 212°, when brought down to the East coast again. Captain Speke's second expedition will perhaps indicate when the index error, which subsequently increased to this great extent, became sensible. There was only one lunar observation taken for the longitude of Ujiji, which point determines the position of the lake, and this was discarded, and the position laid down from dead reckoning; but I believe that it cannot be far wrong. How energetically the intrepid travellers essayed, without

success, to reach the north end of the lake, and thus solve the great secret, has been often told. They had, however, seen what appeared to be the end of the lake, in lat. $3^{\circ} 8' s$.

The general character of Tanganyika Lake, as ascertained by observations and by hearsay, was as follows:—From Ujiji to the north end, as far as was seen, was about 100 geographic miles. Captain Burton estimated, from report, that it was 150 miles from Ujiji to the south end, making it 250 miles in length. Captain Speke's maps extend this considerably. His first map makes its south end 230 miles from Ujiji, terminating in lat. $8^{\circ} 30' s$. His second map abridges this to lat. $8^{\circ} 6'$. His first published map reduces it to lat. $7^{\circ} 45'$, like Captain Burton's estimate. This would be within 80 or 100 miles of Lucenda, the Cazembe capital.

It is evidently very deep, but no soundings could be taken. No mention is made, or evidence seen, of any change of level.

That an inland sea, of such magnitude, receiving the drainage of such a great extent of country, in a climate where the evaporation bears a large proportion to the rainfall, it is quite incredible that its waters should be FRESH. In the countless ages since its formation, it must have become saline, like the Dead Sea, as an extreme case, or the Caspian as another, or the Shirwa Lake of Dr. Livingstone, the deep waters of which are brackish, and taste like a weak solution of Epsom salts.

If this be granted, there are only three solutions to the problem. First, that it has an outlet to the Indian Ocean south of the route of the two East Africa expeditions; or, secondly, that some river runs to the westward, forming an affluent of the Congo, or other large Atlantic river; or, thirdly, that it drains northwards, to which argument these remarks tend.

In the first place, its outlet cannot run towards the Indian Ocean, to the northward of the parallel of its southern end, for that region was perfectly explored by Burton, Speke, and Grant. The Lufigi River, which debouches in lat. $8^{\circ} 0' s$, has not been examined, but its known character will not admit of such a supposition. Its upper course, known as the Ruaha, traverses the upland desert only in the rainy season, and the space between its occasional sources and the south end of Tanganyika Lake is constantly traversed by the Arab caravans passing from Zanzibar towards Lucenda, for ivory, and Kitanda, or Kitata, south of the Cazembe's, for copper. These cross, or pass, a shallow morass or lake, the Rukwa lagoon, which, at times, joins the Tanganyika Lake. No river is crossed. The Ruaha, whose real sources are still unknown, is not passed. It cannot, then, run eastward.

The second alternative is, that it drains to the westward, or, in other words, that it either contains the source of the Congo, whose mouth is 1100 miles from the western shore of the lake, or that the waters flowing westward are finally absorbed by evaporation. To combat these views with the facts at command would lead far beyond the limits of this paper. Suffice it to say, that several routes to the westward of the Tanganyika not only negative this, but also would almost prove that the waters flow *into* the lake. The great distance will present now the most cogent argument against this; while we have the third, that the Rusizi River is an affluent.

The THIRD point is this northern outlet of the lake.

The additional knowledge we now have places this matter in a very different position from what it was in 1859, and the author avers that, if our late data be correct, there could be no other solution to the Nile question. He would name the difficulties as they have arisen.

After Burton and Speke had finished their exploration of Tanganyika, they returned, with means almost exhausted, to Kazeh; and here Captain Speke completed a rough outline of their route, and forwarded it to England, with a map, which shows that they conceived that the Tanganyika continued to a valley open to the N.N.W. Captain Speke, leaving Burton to prepare for their return march, then started for the northern, or Ukerewe, lake, July 9th, and on August 3rd observed it to be higher than Kazeh, or 3740 feet. This, also, was an imperfect result, from the defective thermometer. Returning to Kazeh, they collected the remnant of their property, and retraced their steps to the coast.

After having visited the Ukerewe, or Victoria Nyanza, Captain Speke was firmly convinced that this was the true and *only* head of the Nile. That it is one of these reservoirs, no one can doubt. But in order to account for the supposed southern flow of the Ruzizi River, he drew a range of lofty mountains around the head of the lake, and between it and his own Lake Victoria, at a distance of 150 to 170 miles to the northward. These were purely hypothetical, as they were never seen or heard of.

The second East Africa expedition, under Captains Speke and Grant, went over precisely the same ground that the first had done, except where crossing the lofty coast ranges. Arrived at the upper plateau, we find that the thermometric observations in the second expedition, as compared with the first, give a lower elevation of about 350 feet to the country up to within 40 miles of Kazeh, their crucial station; but here the second elevations exceed the first by about 100 feet. It is probable, therefore, that hereabout the instruments in the first expedition began to fail.

It has been objected that these absolute and independent observations by the thermometer involve a fallacy, as the difference of level thus shown must be dependent on the varying pressure of the atmosphere: but to this may be replied that this region is so near to the equator, that the diurnal or secular variations of the barometer are nearly at a minimum, and that the whole range, except during cyclones or hurricanes, does not exceed a very few tenths of an inch in the mercurial column (each tenth of an inch representing 85 feet of elevation); and that all the observations relating to this point were taken under the same circumstances. Most certainly absolute accuracy must not be demanded for them; at best they can be but approximations.

Captain Speke made the elevation of the north side of his Victoria Nyanza (in his second expedition) to be 432 feet lower than in the first; and between this point and Gondokoro he made four other observations, to which Mr. Findlay wished to draw especial attention. The first is near Kamrasi's Palace (Luluga), 2856 feet; the second at the Karuma Falls, 2970 feet; the third, South Luluga, between Karuma Falls and Kamrasi's, 2906 feet; and Paira, 18 miles south of the junction of the Asua River, 1793 feet. (Sir Samuel Baker says that the Nile, issuing from the Albert Nyanza, is navigable as far as this, and therefore they are on the same level.) Finally, Gondokoro was made to be 1298 feet above the sea. Captain Speke's thermometers were not brought home, and therefore their index errors, which were probably considerable, could not now be ascertained. But they are all relative to each other, and one common correction would apply to all.

Captain Speke heard of the Great Lake, to the westward of Kamrasi's, since explored by Sir Samuel Baker, and named by him the Albert Nyanza. This lake was also reported to lie in almost the same position by Mr. Petherick, from information given to him by his man Mussaad, who went southward to within four days' march north-west of the north end of the lake. It was also announced by Dr. Peney, May 20th, 1861.

In addition to this lake, Captain Speke places another, the Rusizi Lake, at the distance of 110 miles due north of the north extremity of the Tanganyika Lake, and connects them by the Rusizi River, which passes through Uzige country. This Rusizi Lake therefore lies in the heart of the mountains he inferred to exist in 1858.

The names Ujiji, Rusizi, Uzige, N'zige, which are placed on this line by Captain Speke, have a great resemblance to each other.

Mr. Consul Petherick reached Gondokoro, Feb. 20th, 1863, and made the elevation by thermometer B. P. (three observations) 1265

feet, a remarkable coincidence with those of Captain Speke's—they are identical.*

Mr. Petherick gave a similar thermometer to Sir Samuel Baker, who had arrived at Gondokoro a few days previously; and this also has been returned and tested,† so that its error, and the application of the difference, is not only available for its own results, but will also test and correct those which can be directly connected with it.

Sir Samuel Baker and his lady ascended the rivers on the track which had been descended by Captains Speke and Grant; and, with this thermometer of Mr. Casella's, he observed the altitude at the four places mentioned above as having been observed by Captain Speke. For the sake of comparison they are placed (with Gondokoro) in juxtaposition below; those of Captains Speke and Grant being uncorrected, and those of Sir Samuel Baker with the final corrections determined on at Kew.

	SPEKE.		SIR S. BAKER.	Difference.
Luluga (Kamrasi's) ..	2856 ft.	Mrooli (do.) ..	4061 ft.	1205 ft.
Karuma Falls	2970	3966	1026
S. Luluga	2906	4056	1150
Paira	1793	(R. Nile, near) ..	2720	927
Gondokoro	1298	1999	701

Mean of the five differences, 1002 ft.

We have thus a clear difference between Captain Speke and Sir Samuel Baker of 1000 feet, at nearly, or quite, the same places. This may seem to be a very large proportion of the entire elevations; but it should be remembered that even in the last one, Gondokoro, it has been thought necessary to add 700 feet to the result obtained by Mr. Petherick with the same instrument.

This difference of 1000 feet must therefore be either *subtracted* from Sir S. Baker's elevations or *added* to Captain Speke's; one or the other will prove the point Mr. Findlay wished here to insist on.

Not only would this correction regulate the observations made in Captain Speke's second expedition, but it would apply to those made in the first, as the second passed over the same ground.

It has been said above that the second expedition made Kazeh 92 feet, as a mean, higher than did the first. Therefore the observation at Tanganyika must also be brought in, as it was made by the same instrument, placing it at 1844 feet.

Now, as Captain Speke's measurements throughout are consistent with each other, if we accept them as correct, it is perfectly possible

* Mr. Petherick's observations are given in the 'Journal Royal Geographical Society,' 1865, vol. xxxv., p. 300.

† See 'Journal Royal Geographical Society,' 1866, vol. xxxvi., p. 16, where Sir S. Baker's observations are computed and investigated by Mr. Dunkin.

for Tanganyika Lake at 1844 feet to flow into Gondokoro at 1298 feet, past Paira at 1793 feet elevation.

But then, Sir Samuel Baker makes the Albert Nyanza to be elevated 2720 feet. If we take Captain Speke's observations as correct, this must be *reduced* to 1720 feet, identical with Captain Speke's observations at Paira, nearly or quite on the lake level; or, what is much more reasonable, we must apply the known correction by Sir S. Baker's thermometer to Captain Speke's observation, acknowledged to be imperfect; this will bring Tanganyika Lake up to 2844 feet, or **124 FEET ABOVE THE ALBERT NYANZA.**

Either of these views will quite determine the question as to the POSSIBILITY of Lake Tanganyika being connected with the Albert Nyanza.

Without claiming for these hypsometrical observations any refinement—they can be but simple approximations—and putting aside minor differences, it might be broadly stated that these two great western lakes *are on the same level.*

As to the geographical position of the lakes, this is most simply met.

Captain Speke heard, in 1861-2, of a lake, the Rusizi, due north of the Tanganyika Lake, and lying between latitudes 1° and 2° s., westward of the lofty Mfumbiro Peak.

Sir Samuel Baker sailed down the north-eastern side of the lake, past its abrupt cliffs of granite and gneiss, rising abruptly from the water to 1200 and 1500 feet high, and heard from King Kamrasi and many natives that it was well known as far as between latitudes 1° and 2° s., when it turns to the westward, the extent being unknown even to Rumanika, king of Karagwé.

This enormous lake, thus at least 260 miles in length, embosomed in lofty mountains on either hand, extends to and covers the site of the Rusizi Lake heard of by Captain Speke, and passes over his mountains of 1858.

Who, then, can doubt, if the data we possess be worth anything, but that *they are one and the same lake?*

The author therefore claims for Lake Tanganyika, as he did in 1859, when he stood alone, the honour of being the SOUTHERNMOST RESERVOIR OF THE NILE, until some more positive evidence, by actual observation, shall otherwise determine it.

Dr. Livingstone, by determining the division of the water-flow to the westward of his Nyassa Lake, in September, 1863, had, therefore, probably reached some of those occasional streamlets which feed the Nile.

The true sources of the Nile must be looked for in the mountains west and north-west of the Nyassa Lake, or in the great Serra

Muchinga of the Portuguese travellers, between latitudes 11° and 12° south. Thus adding 600 miles to the known course of that wonderful river, to which each new discovery adds a new interest.*

The paper will be published verbatim in the *Journal*, vol. xxxvii.

The PRESIDENT said he was sure every geographer would appreciate the ability, ingenuity, and pains which Mr. Findlay had displayed in this paper, which collated all the notices we had of the interior of Africa, whether drawn from Portuguese records or the discoveries made by our own countrymen. Mr. Findlay had got over the difficulty, as he thought most satisfactorily, of the supposed lower level of the Lake Tanganyika, upon which the whole question rested. Mr. Findlay had collated the observations made independently by Captain Speke on the one hand, and by Sir Samuel Baker on the other, at exactly the same points, and had found that they differed, on an average, by 1000 feet. Arguing from this difference, and diminishing or augmenting the height, he inferred it was extremely probable that the Lake Tanganyika might be 1000 feet above the level it was supposed to occupy, or Albert Nyanza 1000 feet lower. He agreed with Mr. Findlay that Dr. Livingstone had completely settled the question of Lake Nyassa having not only no northern outlet, but being really fed from the north. Before calling for any observations on the paper, it was his duty to state, with reference to Livingstone's travels, that two of the gentlemen were present out of the four who were going out in the expedition of search—Mr. Young, the leader, and Mr. Faulkner, as a volunteer at his own cost. These gentlemen were to sail on the 10th inst.; and, as they were about to depart so soon, he begged to introduce them to the meeting.

Mr. YOUNG said he would endeavour to explain what the expedition under his command intended to do. In the first place, they would sail from England in the Cape Mail steamer, taking with them the steel boat, provisions, and barter-goods for the journey. When they arrived at the Cape, one of our cruisers would transport them to the mouth of the Zambesi. The boat—which was made to take to pieces in sections, weighing 47 lbs. each—would then be put together; and in it they would proceed up the Zambesi to the Shiré, then up that river until they arrived at the Murchison Cataracts. Here the boat would be again taken to pieces, and carried past the cataracts to the Upper Shiré, and there screwed together again. From that point they would be able to proceed the whole of the way by water to the north end of Lake Nyassa, to within 50 miles of where Livingstone was supposed to have been murdered. For his part, he did not believe the report of Moosa, the Johanna man, who had been under him nearly two years on the Zambesi, and had shown himself to be totally untruthful.

Mr. PETHERICK said if Sir Samuel Baker's altitudes were to be adopted with regard to the Albert Nyanza, and the former observations of Captain Speke were to be corrected and brought into unison with them, in consequence of the inferior kind of instrument he employed, the statements of Mr. Findlay make the altitude of the Tanganyika sufficient to connect it with the Albert Nyanza. But in that case the connection of Victoria Nyanza with the Albert would

* The length of the Nile's course from Gondokoro to its mouth, following its major windings, is about 2400 geographic miles (or 2780 British miles). From Gondokoro, near to which, it was generally argued, ten years ago, that the southernmost head of the Nile would be found to the south end of Tanganyika Lake, is 830 geographic miles (or 960 British miles). If the source be near the Muxinga Range, it must be 270 geographic miles (or 312 British miles) still further south, so that its total course will be 3500 geographic, or 4050 British miles, —almost unparalleled by any other river.

seem very doubtful; for how could the Somerset River fall into the Albert Nyanza, which would be raised 700 or 800 feet above it? He would ask the meeting to recollect that the only actual measurements of the volumes of water of the Nile Rivers ever sent to this country were made by himself in 1863; such measurements were of the highest importance in discovering the lake origin of the Nile and its tributaries. His observations showed these results:—In latitude 9° N. nearly, at the mouth of the Bahr-el-Ghazal, the volume of water poured by the Ghazal into the Nile measured 3000 cubic feet per minute; while that conveyed by the Nile itself, independently of the Bahr-el-Ghazal, was in round numbers 8000 cubic feet per minute. It was a common Rule of Three sum,—if it took a tract of country embracing between 5° and 6° of latitude to furnish 3000 cubic feet of water per minute to the Nile, how many degrees of latitude would it take to furnish three times that amount? The problem would show that the conclusions of Mr. Findlay, arrived at two thousand years ago by Ptolemy, were not exaggerated, and that the flow of water coming down into the Nile might reasonably be expected to come the distance that had been stated. Another observation to be deduced from Mr. Findlay's altitudes, would prove the improbability of the connection of the Victoria Nyanza with the Albert Nyanza. Independently of the 8000 cubic feet per minute conveyed by the Nile in latitude 9° N., and the 3000 conveyed by the Bahr-el-Ghazal, the Sobat affluent conveyed nearly 9000 cubic feet per minute, a greater volume of water than the Nile itself. Therefore, he would throw out this suggestion, that the Sobat might really be the river that issued from the Victoria Nyanza, as the Nile itself was derived from the Albert. The Sobat might fairly be supposed to have its source nearly as far south as the White Nile. With respect to the search expedition which was about to set sail, he entirely coincided with the President in disbelieving the report of Livingstone's death. Any man who had had a long experience of the negroes of those districts would detect a falsehood on the very face of the story that Moosa had told. It was too circumstantial for a true account. His statement that after the fight he returned with his companions several hours afterwards and found the bodies of Livingstone and three or four of his companions on the ground unmolested, was so unlike the usual mode of proceeding of these people, that it could not be correct. Every African traveller knows that the trophy most prized by savages, such as the Mavite, would be a portion of the body of the enemy they had slain; and if the poor Doctor had fallen, his body would have been cut up into as many pieces as there were savages to be gratified. It was, he thought, to be deeply regretted that the object of the expedition, now about to leave England, was merely to ascertain the certainty of the fate of Dr. Livingstone, and was on so small a scale as to preclude it from the possibility of affording the illustrious traveller, should he be in life, that relief of which he must be in need. Mr. Petherick had been in his late journey in a similar strait, and had he not most fortunately obtained supplies from one of his trading stations, he and his entire party must have succumbed.

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2. *On the Map of Africa published in Pigafetta's 'Kingdom of Congo,' in 1591.* By R. H. MAJOR, Esq., Secretary, Royal Geographical Society.

It is the usual practice at our meetings to lay before the Society some substantive fact in the shape of real recent exploration, which may extend our geographical knowledge. Such is not the case this evening. Mr. Findlay's observations have, from the nature of the